

# PATENT COOPERATION TREATY

# PCT

## INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY


(Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

REC'D 29 MAR 2006

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Applicant's or agent's file reference 051319-0192 PCT	FOR FURTHER ACTION	See Form PCT/IPEA/416																								
International application No. PCT/US04/26628	International filing date (day/month/year) 17 August 2004 (17.08.2004)	Priority date (day/month/year) 04 November 2003 (04.11.2003)																								
International Patent Classification (IPC) or national classification and IPC IPC: F16C 32/06( 2006.01) USPC: 384/107																										
Applicant NMB (USA), INC.																										
<p>1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.</p> <p>2. This REPORT consists of a total of <u>2</u> sheets, including this cover sheet.</p> <p>3. This report is also accompanied by ANNEXES, comprising:</p> <p style="margin-left: 20px;">a. <input checked="" type="checkbox"/> (sent to the applicant and to the International Bureau) a total of <u>1</u> sheets, as follows:</p> <div style="margin-left: 40px;"> <input type="checkbox"/> sheets of the description, claims and/or drawings which have been amended and are the basis of this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).  <input type="checkbox"/> sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.         </div> <p style="margin-left: 20px;">b. <input type="checkbox"/> (sent to the International Bureau only) a total of (indicate type and number of electronic carrier(s)) _____, containing a sequence listing and/or tables related thereto, in electronic form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).</p>																										
<p>4. This report contains indications relating to the following items:</p> <table style="width: 100%; border: none;"> <tr> <td style="width: 10%;"><input checked="" type="checkbox"/></td> <td style="width: 20%;">Box No. I</td> <td>Basis of the report</td> </tr> <tr> <td><input type="checkbox"/></td> <td>Box No. II</td> <td>Priority</td> </tr> <tr> <td><input type="checkbox"/></td> <td>Box No. III</td> <td>Non-establishment of opinion with regard to novelty, inventive step and industrial applicability</td> </tr> <tr> <td><input type="checkbox"/></td> <td>Box No. IV</td> <td>Lack of unity of invention</td> </tr> <tr> <td><input checked="" type="checkbox"/></td> <td>Box No. V</td> <td>Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement</td> </tr> <tr> <td><input type="checkbox"/></td> <td>Box No. VI</td> <td>Certain documents cited</td> </tr> <tr> <td><input type="checkbox"/></td> <td>Box No. VII</td> <td>Certain defects in the international application</td> </tr> <tr> <td><input type="checkbox"/></td> <td>Box No. VIII</td> <td>Certain observations on the international application</td> </tr> </table>			<input checked="" type="checkbox"/>	Box No. I	Basis of the report	<input type="checkbox"/>	Box No. II	Priority	<input type="checkbox"/>	Box No. III	Non-establishment of opinion with regard to novelty, inventive step and industrial applicability	<input type="checkbox"/>	Box No. IV	Lack of unity of invention	<input checked="" type="checkbox"/>	Box No. V	Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement	<input type="checkbox"/>	Box No. VI	Certain documents cited	<input type="checkbox"/>	Box No. VII	Certain defects in the international application	<input type="checkbox"/>	Box No. VIII	Certain observations on the international application
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Date of submission of the demand 15 December 2005 (15.12.2005)	Date of completion of this report 08 March 2006 (08.03.2006)																									
Name and mailing address of the IPEA/ US Mail Stop PCT, Attn: IPEA/US Commissioner for Patents P.O. Box 1450 Alexandria, Virginia 22313-1450 Facsimile No. (571) 273-3201	Authorized officer Thomas R. Hannon  Telephone No. (571) 272-5350																									

## INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.

PCT/US04/26628

## Box No. I Basis of the report

## 1. With regard to the language, this report is based on:

- ☒ the international application in the language in which it was filed.
- ☐ a translation of the international application into English, which is the language of a translation furnished for the purposes of:
- ☐ international search (under Rules 12.3 and 23.1(b))
- ☐ publication of the international application (under Rule 12.4(a))
- ☐ international preliminary examination (under Rules 55.2(a) and/or 55.3(a))

2. With regard to the elements of the international application, this report is based on (*replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report*):

- ☐ the international application as originally filed/furnished
- ☒ the description:  
pages 1-23 as originally filed/furnished  
pages\* NONE received by this Authority on \_\_\_\_\_  
pages\* NONE received by this Authority on \_\_\_\_\_
- ☒ the claims:  
pages 24,26,28-31,33,34 and 36-39 as originally filed/furnished  
pages\* NONE as amended (together with any statement) under Article 19  
pages\* 25,27,32 and 35 received by this Authority on 15 December 2005 (15.12.2005)  
pages\* NONE received by this Authority on \_\_\_\_\_
- ☒ the drawings:  
pages 1-4 as originally filed/furnished  
pages\* NONE received by this Authority on \_\_\_\_\_  
pages\* NONE received by this Authority on \_\_\_\_\_
- ☐ a sequence listing and/or any related table(s) - see Supplemental Box Relating to Sequence Listing.

3. ☐ The amendments have resulted in the cancellation of:

- ☐ the description, pages \_\_\_\_\_
- ☐ the claims, Nos. \_\_\_\_\_
- ☐ the drawings, sheets/figs \_\_\_\_\_
- ☐ the sequence listing (*specify*): \_\_\_\_\_
- ☐ any table(s) related to the sequence listing (*specify*): \_\_\_\_\_

4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).

- ☐ the description, pages \_\_\_\_\_
- ☐ the claims, Nos. \_\_\_\_\_
- ☐ the drawings, sheets/figs \_\_\_\_\_
- ☐ the sequence listing (*specify*): \_\_\_\_\_
- ☐ any table(s) related to the sequence listing (*specify*): \_\_\_\_\_

\* If item 4 applies, some or all of those sheets may be marked "superseded."

## INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.  
PCT/US04/26628**Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement****1. Statement**

Novelty (N)	Claims <u>1-30</u>	YES
	Claims <u>NONE</u>	NO
Inventive Step (IS)	Claims <u>1-30</u>	YES
	Claims <u>NONE</u>	NO
Industrial Applicability (IA)	Claims <u>1-30</u>	YES
	Claims <u>NONE</u>	NO

**2. Citations and Explanations (Rule 70.7)**

Claims 1-3, 5-9, 12-18, 20-24, and 27-30 meet the criteria set out in PCT Article 33(2)-(3), because the prior art does not teach or fairly suggest the combination of a larger and smaller diameter portions with a third dynamic pressure groove formed on the surfaces of the end plate or end of the shaft, nor the combination including a tapered stepped surface between the larger diameter and small diameter portion, nor the combination having third and fourth dynamic pressure grooves formed on the step part between the shaft diameters and between expanded diameter and the thrust plate. The prior art also neither teaches nor renders obvious the combination of larger and smaller diameter shaft and housing portions with annular and circular grooves formed therein with an annular ring straddling the annular groove and the circular groove to prevent the stepped shaft from slipping out of the cylinder hole.

Claims 4, 10, 11, 19, 25, and 26 meet the criteria set out in PCT Article 33(2)-(3), because the prior art does not teach or fairly suggest the combination in which the first step portion faces the second step portion, nor the stepped cylindrical hole formed in the bearing case, the cylindrical hole having a large diameter part, a small diameter part and an expanded diameter part on one end of the cylindrical hole.

Claims 1-30 meet the criteria set out in PCT Article 33(4), and thus have industrial applicability because the subject matter claimed can be made or used in industry.

----- NEW CITATIONS -----

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3. The fluid dynamic bearing mechanism of claim 2 further comprising:

a widened section formed in the large diameter part of the cylindrical hole to form a widened seal part.

4. A fluid dynamic bearing mechanism comprising:

a cylindrical bearing case;

a stepped cylindrical hole formed in the bearing case, the cylindrical hole having a large diameter part, a small diameter part and a first step portion formed at the junction of the large diameter part and the small diameter part;

an end plate that seals one end of the bearing case to form a bearing housing;

a stepped shaft inserted in the bearing housing, the shaft having a large diameter part and a small diameter part and a second step portion formed at the junction of the large diameter part and the small diameter part, wherein the first step portion faces the second step portion;

a first dynamic pressure groove formed on the outer circumferential surface of either the large diameter part of the cylindrical hole or the large diameter part of the stepped shaft;

a second dynamic pressure groove formed on the outer circumferential surface of either the small diameter part of the cylindrical hole or the small diameter part of the stepped shaft;

a third dynamic pressure groove formed on either the first step portion or the second step portion; and

lubricating oil filled in small gaps formed between facing surfaces adjacent to the first dynamic pressure groove, the second dynamic pressure groove, and the third dynamic pressure groove.

5. The fluid dynamic bearing mechanism of claim 4 further comprising:

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lubricating oil filled in small gaps formed between facing surfaces adjacent

to the first dynamic pressure groove, the second dynamic pressure groove, and the third dynamic pressure groove.

8. The fluid dynamic bearing mechanism of claim 7 further comprising:

an annular groove formed in the cylindrical hole;

a circular groove formed on the stepped shaft; and

an annular ring straddling the annular groove and the circular groove to

prevent the stepped shaft from slipping out of the cylindrical hole.

9. The fluid dynamic bearing mechanism of claim 8 further comprising:

a widened section formed in the large diameter part of the cylindrical hole to form a widened seal part.

10. A fluid dynamic bearing mechanism comprising:

a cylindrical bearing case;

a stepped cylindrical hole formed in the bearing case, the cylindrical hole having a large diameter part, a small diameter part and an expanded diameter part on one end of the cylindrical hole, the expanded diameter part having a step part;

an end plate that seals one end of the bearing case to form a bearing housing;

a stepped shaft inserted in the bearing housing, the shaft having a large diameter part and a small diameter part;

a thrust ring fit on the stepped shaft, the thrust ring being received into the expanded diameter part;

a first dynamic pressure groove formed on the outer circumferential surface of either the large diameter part of the cylindrical hole or the large diameter part of the stepped shaft;

to the first dynamic pressure groove, the second dynamic pressure groove, and the third dynamic pressure groove.

17. The hard disk drive of claim 16 further comprising:

an annular groove formed in the cylindrical hole;

a circular groove formed on the stepped shaft; and

an annular ring straddling the annular groove and the circular groove to

prevent the stepped shaft from slipping out of the cylindrical hole.

18. The hard disk drive of claim 17 further comprising:

a widened section formed in the large diameter part of the cylindrical hole to form a widened seal part.

19. A hard disk drive comprising:

a motor having a rotor mounted on a shaft; and

a disk mounted on the rotor, wherein the shaft is supported in a fluid dynamic bearing mechanism comprising:

a cylindrical bearing case;

a stepped cylindrical hole formed in the bearing case, the cylindrical hole having a large diameter part, a small diameter part and a first step portion formed at the junction of the large diameter part and the small diameter part;

an end plate that seals one end of the bearing case to form a bearing housing;

a stepped shaft inserted in the bearing housing, the shaft having a large diameter part and a small diameter part and a second step portion formed at the junction of the large diameter part and the small diameter part, wherein the first step portion faces the second step portion;

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a widened section formed in the large diameter part of the cylindrical hole to form a widened seal part.

25. A hard disk drive comprising:

a motor having a rotor mounted on a shaft; and

a disk mounted on the rotor, wherein the shaft is supported in a fluid

dynamic bearing mechanism comprising:

a cylindrical bearing case;

a stepped cylindrical hole formed in the bearing case, the cylindrical hole having a large diameter part, a small diameter part and an expanded diameter part on one end of the cylindrical hole, the expanded diameter part having a step part;

an end plate that seals one end of the bearing case to form a bearing housing;

a stepped shaft inserted in the bearing housing, the shaft having a large diameter part and a small diameter part;

a thrust ring fit on the stepped shaft, the thrust ring being received into the expanded diameter part;

a first dynamic pressure groove formed on the outer circumferential surface of either the large diameter part of the cylindrical hole or the large diameter part of the stepped shaft;

a second dynamic pressure groove formed on the outer circumferential surface of either the small diameter part of the cylindrical hole or the small diameter part of the stepped shaft;

a third dynamic pressure groove formed on either an inner surface of the end plate or a bottom surface of the thrust ring;